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ANALYTICAL SOLUTION FOR ONE-, TWO-, AND THREE-
DIMENSIONAL SOLUTE TRANSPORT IN GROUND-WATER
SYSTEMS WITH UNIFORM FLOW -- SUPPLEMENTAL REPORT:
SOURCE CODES FOR COMPUTER PROGRAMS AND SAMPLE
DATA SETS

by

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Open-File Report 92-78 - *Diskette Report*
(A companion report to U.S. Geological Survey
Techniques of Water-Resources Investigations 3-B7.)

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INTRODUCTION

Analytical solutions to the advective-dispersive solute transport equations are useful in predicting the fate of solutes in ground water. Analytical solutions compiled from available literature or derived by the author for a variety of boundary condition types and solute-source configurations were presented in a companion report (Wexler, 1991). A set of computer programs was written to evaluate these solutions and to display the results in tabular and computer graphics format. These programs incorporate many features that enhance their accuracy and ease of use. Documentation for the programs, which describes their operation and required input data and which presents the results of sample problems, was included in the companion report along with listings of the source codes.

To facilitate distribution of these programs, this report, released as a 5.25 inch, double-sided, double-density, IBM-PC format diskette, contains source codes for the programs described in Wexler (1991) along with data sets for each of the sample problems.

Although these programs have been used by the U.S. Geological Survey, no warranty, expressed or implied, is made by the USGS as to the accuracy and functioning of the program and related program material, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the USGS in connection therewith. Also, any use of trade, product, or firm names in this report is for descriptive purposes only and does not imply endorsement by the U.S. Government.

The programs were originally written for a Prime minicomputer but all programs should run using other PC FORTRAN compilers with minor modifications as described in Wexler (1991). The mathematical and input and output routines have been combined into a file called SUBS.F77 which can be compiled first and then linked with the selected MAIN program and the appropriate FORTRAN libraries.

The plot routines were written with DISSPLA software (ISSCO, 1981) calls and can be used on a PC with the PC version of the DISSPLA library. Alternatively, data can be easily extracted from the program output and plotted using PC graphics presentation programs.

CONTENTS OF DISKETTE

The following 34 files are contained on the diskette:

1. FINITE.F77 - One dimensional, finite-length system
2. SEMINF.F77 - One dimensional, semi-infinite system
3. POINT2.F77 - Two dimensional, infinite system, with a point source having a known injection rate
4. STRIPF.F77 - Two dimensional, finite width and semi-infinite length system with a strip source
5. STRIPI.F77 - Two dimensional, infinite width and semi-infinite length system with a strip source
6. GAUSS.F77 - Two dimensional, infinite width and semi-infinite length system with a gaussian source
7. POINT3.F77 - Three dimensional, infinite system, with a point source having a known injection rate
8. PATCHF.F77 - Three dimensional, finite width and height and semi-infinite length system with a patch source
9. PATCHI.F77 - Three dimensional, infinite width and height and semi-infinite length system with a patch source
10. EXERFC.F77 - Routine to compute $\exp(x) \cdot \text{erfc}(y)$
11. GLQPTS.F77 - Routine to read the Gauss-Legendre quadrature points
12. OFILE.F77 - Routine to opens input and output data files
13. TITLE.F77 - Routine to print title box with time and date
14. PLOT1D.F77 - Routine to plot concentration with respect to time
15. PLOT2D.F77 - Routine to plot lines of equal solute concentration in the XY plane for each specified time value
16. PLOT3D.F77 - Routine to plot lines of equal solute concentration in the XY plane for each specified time and Z coordinate value
17. CNTOUR.F77 - Routine to draw the contour lines
18. SUBS.F77 - File containing all mathematical, input/output, and plotting routines
19. GLQ.PTS - Data file containing the Gauss-Legendre quadrature points

- 20. SAMPLE1A.DAT - Data set for sample problem 1a
- 21. SAMPLE1B.DAT - Data set for sample problem 1b
- 22. SAMPLE2.DAT - Data set for sample problem 2
- 23. SAMPLE3A.DAT - Data set for sample problem 3a
- 24. SAMPLE3B.DAT - Data set for sample problem 3b
- 25. SAMPLE4.DAT - Data set for sample problem 4
- 26. SAMPLE5.DAT - Data set for sample problem 5
- 27. SAMPLE6.DAT - Data set for sample problem 6
- 28. SAMPLE7.DAT - Data set for sample problem 7
- 29. SAMPLE8A.DAT - Data set for sample problem 8a
- 30. SAMPLE8B.DAT - Data set for sample problem 8b
- 31. SAMPLE9.DAT - Data set for sample problem 9
- 32. SAMPLE10.DAT - Data set for sample problem 10
- 33. SAMPLE11.DAT - Data set for sample problem 11
- 34. READ.ME - This file

REFERENCES CITED

ISSCO, 1981, DISSPLA - Display integrated software and plotting language users manual: Integrated Software Systems Corporation, San Diego, California, 701 p.

Wexler, E.J., 1991, Analytical solutions for one-, two-, and three-dimensional solute transport in ground-water systems with uniform flow: United States Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter B7, 190 p.